

Japanese government venture capital: what should we know?

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Abstract

Purpose – The purpose of this paper is to discuss the implication of Japanese government venture capital (VC) policies for future research and to provide basis for policymakers and practitioners.

Design/methodology/approach – This is an academic literature review of available peer-reviewed publications on government VC policies. This paper discusses and analyses the current state and issues of the Japanese government VC policies regarding three research questions: What do Japanese government VCs do? Do they contribute to their portfolios? and Do they contribute to the development of VC market?

Findings – There are mainly two findings in this paper: It is effective to establish a complementary relationship with private VCs for Japanese government VCs to contribute to their portfolios; Japanese government should simultaneously continue to make and review policies for the VC market, the stock market, the entrepreneur sector and the environment surrounding them by its strategic long-term commitment to contribute to the development of VC market and new technology-based firms in Japan.

Originality/value – As there are only a few studies on recently strengthened Japanese government VC policies, this paper provides an in-depth discussion on these Japanese VC policies, which can be used for future research and as a valuable resource for policymakers and practitioners.

Keywords Government venture capital, Japanese government venture capital policy, New technology-based firm, Venture capital market

Paper type Literature review

Introduction

New technology-based firms (NTBFs) play a crucial role in the development of innovative technologies and employment creation as well as economic growth (Audretsch, 1995). Venture capital (VC) has a critical effect on NTBF's growth by providing enough capital to conduct R&D over a long period of time (Pfirrmann *et al.*, 2012) and promote the professionalization of NTBFs through a variety of value adding activities (Bygrave and Timmons, 1992, Hellmann and Puri, 2002). The contributions of VCs are credited for the remarkably rapid growth of NTBFs such as Apple, Google, Microsoft and Amazon, which are referred to as US-style VC models (Gompers and Lerner, 1999). Governments of Asian-Pacific and European countries have realized the significance of VCs and adopted policies to create US-style VC market as a necessary preliminary step to support the generation of NTBFs (Colombo *et al.*, 2010; Schertler, 2006).

The VC market development policy has mainly two approaches: the direct approach and the indirect approach. The direct approach makes up the government VC policies and the



indirect approach activates the VC market by deducting capital gains tax encouraging equity market, providing entrepreneurship training for NTBFs and implementing intellectual property policies (Callagher *et al.*, 2015; Milosevic and Fendt, 2016).

In Japan, government VC policies as a direct approach have been strengthened in recent years with the launch of the Innovation Network Corporation (INC) in 2009. The INC has a capitalization of ¥300bn, breakdown as follows: ¥286bn from the Japanese government and ¥14bn from 26 private corporations. As a further support from the Japanese government, ¥1.8tn have been provided as a government guarantee. In 2014, the government established university spinoff funds totalling ¥100bn and promoted investment activities to fund four universities through the Act on Strengthening Industrial Competitiveness (Act No.98 of Dec. 11.2013), which enables national university corporations to invest in university spinoff funds (Prime Minister of Japan and His Cabinet, 2016). Based on these policies, the Japanese government has set a challenging political key performance indicator (KPI) to double the percentage from 0.028 to 0.056 of annual VC investment ratio to nominal GDP by 2022 in the Japan Revitalization Strategy 2016 (Prime Minister of Japan and His Cabinet, 2016)[1].

This paper studies the government VC policies in Japan that have recently become a fast-growing source of financing for NTBFs. It discusses in detail what Japanese policymakers should know about government VCs and how they should effectively draft, amend and implement policies on government VC policies. This paper could also serve as a reference for future research on government VCs in the academe. Section 2 gives an overview of government VCs and Section 3 describes the current state and issues of the Japanese VC market, as well as government VCs in Japan. After describing the method of research in this paper in Section 4, Section 5 examines the characteristics of government VCs, the contributions to their portfolios and the VC market based on previous research. In Section 6, this paper will discuss the implication of Japanese government VCs policies and provide basis for policymakers and practitioners. Although it is intended to provide basis for Japanese government VC policies, this paper can also contribute to the government VC policies of countries in the Asia-Pacific region other than Japan.

What is government venture capital?

Government VC is a government-funded entity that makes equity or equity-like investments in young firms to encourage other intermediaries to make such investments in the VC market (Lerner, 2002). There are three main categories of government VC:

- (1) Direct government funds managed by government entity funded by 100 per cent government budget.
- (2) Hybrid funds that are funded by both government and private firms and invested in cooperation with the private sector.
- (3) Fund of funds schemes that the government does not invest in NTBFs directly; instead, it invests in private VC funds concentrating on investment in NTBFs (Colombo *et al.*, 2016a).

Governments have established government VCs to bridge the financial gap that occurs when VC markets fail to supply much-needed capital for NTBFs. In the aftermath of the 2008-2009 global financial crisis, private VCs in many countries have become more risk averse and have focused on the matured late stage firms rather on the early stage and high-tech firms (OECD, 2016; Block and Sandner, 2009). One way to close in the financial gap of NTBFs and private VCs is for the government VCs to participate in the VC market to supply needed credit and investment in NTBFs and crowd-in private VCs. The other way is for the government to take

the lead to invest in NTBFs and encourage private VCs to have high-skills as scouts and coaches enough to invest in NTBFs. Originally, VC has been expected to be a financial intermediary that provides social and economic welfare to help alleviate the problems of moral hazard and adverse selection by intensively scrutinizing firms before providing capital and monitoring them afterwards (Chan, 1983). However, it is difficult for VCs to acquire such high expertise immediately. That is why, the government should encourage private VCs to develop such high-level skills by intervening in the VC market or providing valuable inputs in various policy-making.

Japanese venture capital market and government venture capitals

According to Organisation for Economic Co-operation and Development (OECD), the annual investment in Japanese VC market in 2015 is US\$1.105bn, the 4th largest in the world after the US, Canada and Israel. Japan's annual VC investment ratio to GDP is 0.02405 points, which is about from one out of 16 to one fourth compared with Israel's 0.38113, US' 0.33264 and Canada's 0.11760 (OECD, 2016). Compared with countries such as Germany and France, which are considered as bank-centred capital market, Japan ranked even lower (Black and Gilson, 1998, Milosevic and Fendt, 2016). It is noted that the Japanese VC market is not as well-developed as its counterparts when it comes to its ratio to the country's GDP. This situation is the main reason why Japanese government has set a challenging political KPI.

The Japanese VC market has a sluggish development. This can be attributed to the VC market's lack of knowledge and experience in selecting portfolio firms as well as providing value-adding support to NTBFs. Japanese VCs put emphasis on experience rather than on the financial theories during the portfolio firm selection process (Kirihata, 2008a, 2008b). During the post-investment period, Japanese VCs lack the knowledge and skill to provide value-adding support to NTBFs. (Kirihata, 2009, Kirihata, 2017). In addition, other challenges surrounding Japanese VCs were also noted as follows: new-generation independent VCs do not form funds because of their shortage of credit and board members of start-up firms in Japan are not used to equity financing (Ishii, 2011).

There are three main government VC funds set up by the Japanese government: University Spinoff Funds, the funding granted to four major research universities namely, University of Tokyo, Kyoto University, Osaka University and Tohoku University; the INC, the funding set up by the Japanese government and private corporations amounting to a capitalization of ¥300bn; and fund of funds-type investment projects by Organization for Small & Medium Enterprises and Regional Innovation, the funding for investment in innovative start-up firms through private VCs and local government VC policies[2]. These funds are aimed at facilitating the supply of growth funds to NTBFs and expanding management supports for them to eliminate the specific difficulties of the commercialisation process in NTBFs (Ministry of Economy, Trade and Industry, 2016a, 2016b; Kirihata, 2009).

In Table I, the university spinoff VC in Japan increased from 0 per cent in 2014 to 4.1 per cent in 2015. Five years since the establishment of the INC in 2009, the share of the government VC in the Japanese VC market, which consists of central and local government VC and university spinoff VC, was 17.4 per cent in 2015 from almost none in 2009 (Table II).

Methodology

This study uses the academic literature design to answer the following research questions:

- RQ1. What do Japanese government VCs do?
- RQ2. Do they contribute to their portfolios?
- RQ3. Do they contribute to the development of VC market?

This study has reviewed the major databases such as ABI/INFORM, Business Source Premier and Science Direct, Web of Science and Google Scholar and run keyword queries to identify scholarly articles published by the first half of 2017 in peer reviewed journals related to government VC policies. The following keywords and their combinations were used to retrieve relevant articles: “government venture capital,” “government backed venture capital,” “government supported venture capital,” “public venture capital,” “public backed venture capital,” “public supported venture capital” and “university seed fund.” This study has filtered and evaluated the initial pool of more than 210 peer-reviewed papers, which study government VC conceptually or empirically. Then relevant 45 papers have been extracted, which focus on what government VCs do, their contributions to both their portfolios and the development of VC market[3].

With regard to the analysis of current state and issues of the Japanese VC market, as well as government VCs, this paper studied the official documents of the Japanese government and government VCs in addition to the interviews with practitioners and policymakers in both central and local government in Japan.

Academic literature review on government venture capital

What do government venture capitals do?

This section examines what government VCs do during, pre- and post-investment period based on a total of 22 related peer-reviewed papers (Table II). During the pre-investment

| VC-Type | 2014 (%) | 2015 (%) |
|--|----------|----------|
| Independent VC | 29.7 | 34.0 |
| Bank-affiliated VC | 20.9 | 18.2 |
| Securities and insurance-affiliated VC | 19.0 | 21.1 |
| Corporate VC | 5.8 | 6.7 |
| Central and local government VC | 18.3 | 13.3 |
| University spinoff VC | 0.0 | 4.1 |
| Others | 6.4 | 2.7 |

Table I.

Share of investment
by VC-type in Japan

Source: Venture enterprise centre (2016)

| Research topic investment activities | Studies |
|--------------------------------------|---|
| <i>Pre-investment activities</i> | |
| Small and early stage investment | Pintado <i>et al.</i> (2007), Cumming and Johan (2009), Bertoni <i>et al.</i> (2015), Cumming (2007) Dahlstrand and Cetindamar (2000) |
| High-tech investment | Cumming (2007), Bertoni <i>et al.</i> (2015), Knockaert <i>et al.</i> (2010) Cumming and Johan (2009) |
| Local investment | Cumming and Johan (2009), Bertoni <i>et al.</i> (2015) |
| Stable investment | Bertoni <i>et al.</i> (2015), Leleux and Surlemont (2003) Johan <i>et al.</i> (2014) |
| <i>Post investment activities</i> | |
| Active value adding activities | Cumming and Johan (2009), Cumming (2007) Knockaert <i>et al.</i> (2006), Bottazzi <i>et al.</i> (2008), Luukkonen <i>et al.</i> (2013) |
| Long term of investment | Buzzacchi <i>et al.</i> (2013), Jeng and Wells (2000) Cumming and Johan (2010) |

Table II.

Research on
government VC's
pre- and post-
investment activities

period, government VCs tend to invest in early stage high-tech firms (Pintado *et al.*, 2007; Cumming and Johan, 2009; Bertoni *et al.*, 2015; Cumming, 2007), such as biotechnology (Cumming, 2007; Bertoni *et al.*, 2015) and university start-ups (Knockaert *et al.*, 2010). Although there are some contradictory research results such as investment in mature industries in the case of Sweden (Dahlstrand and Cetindamar, 2000) and non-high-tech investment in the case of Pre-Seed Funds in Australia (Cumming and Johan, 2009), this study has verified the tendency of government VCs focusing on investing in early stage and technology based NTBFs (Table II).

In previous studies, it is confirmed that government VCs tend to invest in local firms (Cumming and Johan, 2009; Bertoni *et al.*, 2015). This is because there are many government VCs that have special purpose of stimulating regional economy as mandated by law and regulation (Mason and Pierrakis, 2013; Murray, 1998). Government VCs appear to be the most distinct type of VC investor and their investment patterns are stable over time (Bertoni *et al.*, 2015). Oppositely, in the case of labour-sponsored venture capital corporations in Ontario, Canada, Johan *et al.* (2014) find that the investment stance changed significantly because of the elimination of government tax incentives (Table II).

As to the post-investment activities, government VCs involve their portfolios less than private VCs as observed by Knockaert *et al.* (2006), Bottazzi *et al.* (2008) and Luukkonen *et al.* (2013). However, there are also studies that confirm the government VCs are quite active to involve in their portfolio firm's management (Table II). It is noted that Australian Pre-Seed Funds have smaller portfolios (number of investees) per manager (Cumming and Johan, 2009, Cumming, 2007). Furthermore, government VCs have longer duration of investment (Buzzacchi *et al.*, 2013) and have different sensitivities to the determinants of investment than non-government VCs, which are more sensitive to IPOs (Jeng and Wells, 2000). Though, an exception is noted in the case of labour-sponsored venture capital corporations. They have shorter period of investment duration to IPOs (Cumming and Johan, 2010).

With regard to the research question about what government VCs do, government VCs may have the tendency to invest in early stage, high-tech and local firms compared to private VCs regarding their pre-investment period. Instead, contradictory research results are observed regarding the government VCs involvement in their portfolio firms and the duration of their investment during the post-investment period.

Do government venture capitals contribute to their portfolios?

This section discusses the contribution of government VCs to the portfolios based on a total of 30 related peer-reviewed papers (Table III). Regarding the exits of their portfolios, many studies observe that government VCs do not have positive correlation with their portfolio's exits (Munari *et al.*, 2015; Cumming and Johan, 2010; Cumming and Johan, 2008; Munari and Toschi, 2015; Cumming *et al.*, 2014; Tykvova and Walz, 2007). It seems that government VCs have not encouraged their portfolios to have successful exits compared to private VCs. There are also negative results of government VC's contribution to the improvement of productivity and efficiency (Alperovych *et al.*, 2015) and to the employment of their portfolio firms (Standaert and Manigart, 2018). On the contrary, there are positive results on the firm's growth (Lerner, 1999) and employment increase (Link and Scott, 2012), as indicated in the cases of SBIR in the US and Innovation Investment Funds in Australia (Cumming and Johan, 2014)[4].

Concerning the contribution to the financial aspect of the portfolio firms, researchers find that government VC funding increases the likelihood that firms will receive private VCs

Table III.
Research on
government VC's
contribution to the
portfolios

| Research topic: contribution to portfolio firms | Studies |
|---|--|
| Exit | Munari <i>et al.</i> (2015), Cumming and Johan (2010), Cumming and Johan (2008), Munari and Toschi (2015), Cumming <i>et al.</i> (2014), Tykvova and Walz (2007) |
| Growth | Lerner (1999), Cumming and Johan (2014) |
| Employment | Link and Scott (2012) Standaert and Manigart (2018) |
| Productivity | Alperovych <i>et al.</i> (2015) |
| Staging | Guerini and Quas (2016), Munari <i>et al.</i> (2015), Cumming (2007), Lerner (1999), Toole and Czarnitzki (2007) Brander <i>et al.</i> (2014), Cumming and Johan (2009), Munari and Toschi (2015) |
| Syndication | Munari <i>et al.</i> (2015), Cumming (2007) Cumming and Johan (2009), Munari and Toschi (2015) |
| Debt financing | Meuleman and De Maeseineire (2012) |
| Patenting (innovation) | Toole and Czarnitzki (2007), Cumming and Johan (2014) Pierrakis and Saridakis (2017) |
| R&D partnership | Colombo <i>et al.</i> (2016b), Toole and Czarnitzki (2007) |
| Certification | Lerner (1999) |

(Guerini and Quas, 2016; Munari *et al.*, 2015; Cumming, 2007; Lerner, 1999; Toole and Czarnitzki, 2007). In other research papers by Brander *et al.* (2014), Cumming and Johan (2009) and Munari and Toschi (2015), it has been said that firms funded by government VCs get significantly less total funding than other ones. As to the syndication with private VCs, there are contradicting results in some cases that the government VCs perform better than private VCs (Munari *et al.*, 2015; Cumming, 2007) and vice versa (Cumming and Johan, 2009, Munari and Toschi, 2015)[5].

Regarding the technological contribution to the portfolios, researchers observe that government VCs contribute to portfolio's innovation, which is acquiring patents or R&D partners (Toole and Czarnitzki, 2007; Cumming and Johan, 2014; Colombo *et al.*, 2016b; Toole and Czarnitzki, 2007). In contrast, Pierrakis and Saridakis (2017) find that obtaining investment from government VCs reduces the probability of the portfolio firms to apply for a patent compared with firms that receive investments from private VCs (Table III).

What is noteworthy in prior research on the contribution of government VCs to their portfolios is positive results on syndication investment with private VCs (Table IV). In syndication with private VCs, six related peer-reviewed papers confirm a positive correlation with exits (Brander *et al.*, 2014; Cumming *et al.*, 2014), growth of portfolios (Grilli and Murtinu, 2014a; Grilli and Murtinu, 2014b), innovation (Bertoni and Tykvová, 2015) and staging (Brander *et al.*, 2014).

Table IV.
Research on
syndication effects of
government VC's

| Research topic: syndication effects on portfolio firms | Studies |
|--|--|
| Exit | Brander <i>et al.</i> (2014), Cumming <i>et al.</i> (2014) |
| Growth | Grilli and Murtinu (2014a), Grilli and Murtinu (2014b) |
| Innovation | Bertoni and Tykvová (2015) |
| Staging | Brander <i>et al.</i> (2014) |

On the overview of previous research, it can be noted that many government VCs seem to contribute to less exits of portfolios. Discussions are divided on financial and technical contributions to portfolios. Instead, research studies on SBIR in the US (Lerner, 1999; Link and Scott, 2012) and innovation investment funds in Australia (Cumming and Johan, 2014) confirm contribution to growth and employment in addition to finance and technology. The contribution of government VC's differs depending on research areas. Moreover, in terms of syndication with private VCs, researchers have confirmed positive results of exit, growth, innovation and staging without any negative results.

Do government venture capitals contribute to the development of the venture capital market?

This section discusses the contribution of government VCs to the VC market based on a total of 15 related peer-reviewed papers (Table V). There are positive results among previous research papers that the establishment of government VCs has led to the development of the VC market (Wonglimpiyarat, 2016; del-Palacio, Zhang and Sole, 2012; Avnimelech and Teubal, 2006; Avnimelech and Teubal, 2004) and it has partially contributed to the VC market (Owen and Mason, 2017; Baldock, 2016; Avots *et al.*, 2013; Lim and Kim, 2015).

While there are studies that government VCs crowd-in private VCs in the market (Brander *et al.*, 2014; Cumming and Li, 2013), they crowd-out private VCs (Cumming and MacIntosh, 2006) or crowd-out other government VCs (Cumming and Johan, 2009). Also, there are researches that it is not sure if government VC crowd-in or -out other VCs (Leleux and Surlemont, 2003), that they do not crowd-out at least (Cumming, 2014), and that they only can solve relatively modest market failures (Jääskeläinen *et al.*, 2007).

In the overview of the prior research, many researchers find that government VC's contribute to the development of the VC market, even if its contribution is just partial. However, there are conflicting results on whether or not government VCs crowd-in or -out other VCs.

Implication of government venture capitals in Japan

What do Japanese government venture capitals do?

Major government VCs in Japan such as the INC, university spinoff funds and investment projects by Organisation for Small & Medium Enterprises and Regional Innovation, aim to

Table V.
Research on
government VC's
contribution to the
VC market

| Research topic: contribution to the VC market | Studies |
|---|--|
| Development of VC | Wonglimpiyarat (2016), del-Palacio <i>et al.</i> (2012), Avnimelech and Teubal (2006), Avnimelech and Teubal (2004) Owen and Mason (2017), Baldock (2016), Avots <i>et al.</i> (2013), Lim and Kim (2015) Leleux and Surlemont (2003) Cumming (2014) Jääskeläinen <i>et al.</i> (2007) |
| Crowding-in or -out | Brander <i>et al.</i> (2014), Cumming and Li (2013) Cumming and MacIntosh (2006), Cumming and Johan (2009) |

provide finance for NTBFs and hands-on supports as scouts and coaches. For instance, according to the business plan submitted to Ministry of Economy Trade and Industry by Osaka University Venture Capital (OUVC), which is one of the university spinoff funds in Japan, it mentions that:

OUVC provides not only related technologies in campus or peripheral private firms but also business knowledge to commercialise for core technologies in Osaka University. On top of funds and commercialization supports, OUVC offers hands-on supports of VC managers on high-tech research, something which is rarely provided by private VCs (Ministry of Economy, Trade and Industry, 2013).

This makes OUVC a unique case of a VC offering such technology-based supports to its portfolio firms.

As a direction of its entrepreneurship policy, the Japanese government aims to support a “cycle of start-up creation” which means autonomous and continuous creation of innovative start-ups in Japanese economy (Ministry of Economy, Trade and Industry, 2016a, 2016b). According to Ministry of Economy, Trade and Industry (2016a, 2016b), there are three priority policies. The first one is support for NTBFs by means of VC as scout and coach, as well as supply of risk money by government VC initiatives and tax incentives to promote VC investment. Entrepreneurship training is the second, which make use of international exchange and awards programs. The third one is improvement of start-up-friendly environment by purchase promotion of start-up’s products and services in government procurement in addition to construction of start-up platform (Ministry of Economy, Trade and Industry, 2016a, 2016b).

Japanese government has an intention to improve the skills of private VCs and supply of risk money by government VC’s initiatives in the VC market. Also, it has intended to position government VC as a preliminary step of the “cycle of start-up creation” and to implement along with multiple policies simultaneously, such as supports for NTBFs, entrepreneurship training and start-up-friendly environment at the same time.

Do Japanese government venture capitals contribute to the portfolios?

To contribute to the portfolios for Japanese government VCs, the complementary relationship with private VCs seems to be the key, according to previous research. The syndication with private VCs has not been widely implemented in Japan. However, prior research confirms that it has positive correlation with portfolio’s exit, growth, innovation and staging. Moreover, Colombo and Murtinu (2017) find that syndication between independent VCs and corporate VCs is not correlated with the performance of the investee firms. These findings confirm that the syndication between government and private is more effective than the one between independent and corporate within the private sector. The effectiveness of the collaboration with private VCs is also indicated in government fund of funds schemes. According to Standaert and Manigart (2018), government VC investment in private VCs under this scheme has positive correlation with portfolio’s employment growth.

In the previous section, it was mentioned that the Japanese government has an intention to improve the skills of private VC as scout and coach, as well as supply of risk money for NTBFs by government VC’s initiatives in the market. For instance, OUVC states that one of its investment policies is to provide hands-on support of VC managers on high tech research, something which is rarely provided by private VCs (Ministry of Economy, Trade and Industry, 2013). However, as far as the previous research is concerned, it seems that investments based on complementary relations with the private VCs have achieved remarkably higher results than ones invested by government VC alone. It seems critical for

government VCs to improve the abilities of selection of portfolios and value adding activities by the syndication schemes.

Prior research points out that the following are essential measures for government VCs to improve their investment performance: the selection of the VC managers to consider business aspects and technical criteria and management of intellectual property assets, external relationships, knowledge and human capital, performance-sensitive compensation in addition to the specialisation focusing on certain industrial sectors (Lerner, 2002; Le Bas and Picard, 2006; Cumming and Johan, 2009; Lim and Kim, 2015). For Japanese government VCs, it is necessary to refer to and make use of the implications of these prior studies based on the syndication with private VCs.

Do Japanese government venture capitals contribute to the development of the venture capital market?

In an overview of the prior research based on a total of 15 related peer-reviewed papers, there are conflicting results on whether government VCs crowd-in or -out other VCs. In other words, there is no clear conclusion if they have contributed directly to the VC market. In this situation, it seems to be necessary to expand research areas to NTBF policies including government VCs policies. The prior research confirms the necessity of execution of multiple policies simultaneously. Black and Gilson (1998) highlights its necessity by using chicken and egg analogy based on the case of Germany:

Germany today faces a chicken and egg problem: a venture capital market requires a stock market, but a stock market requires a supply of entrepreneurs and deals which, in turn, require a venture capital market. In addition, German entrepreneurs who care about future control of their company must trust venture capitalists to return control to them some years hence and must further trust that the stock market window will be open when they are ready to go public. The institutional design issue is how to simultaneously create both a set of mutually dependent institutions and the trust that these institutions will work as expected when called upon.

This paper examines prior research studies of NTBF policies based on the cycle of Black and Gilson (1998), which comprises VC market, stock market and entrepreneur sectors.

First, it is necessary for the VC market policies to consider the indirect approach as well as the direct approach by government VCs to contribute the development of VC market, according to Callagher *et al.* (2015). As the indirect approach, investor protection and corporate governance regulation, capital gains tax reduction and deregulation of labour laws are pointed out as effective measures according to Da Rin *et al.* (2006), Groh *et al.* (2010) and Milosevic and Fendt (2016).

Second, the stock market sector has played a major role as an exit for the VC market. Lerner and Tåg (2013) indicate the delay in the development of the finance market in addition to the heavy taxation on entrepreneurs were the factors that the development of the Swedish VC market lagged behind the US. The effectiveness of stock market is not confined to Sweden alone. It has also been mentioned in cases of other countries such as Israel and the US (Avnimelech and Teubal, 2006; Avnimelech and Teubal, 2004; Avnimelech and Teubal, 2008).

Third, the entrepreneur sector has opened investment opportunities for the VC market. Rosiello *et al.* (2011) identify the significance of the sector by mentioning that government policies such as government VCs should be based on the development of high-tech clusters consisting of entrepreneurs, scientists, engineers, incubators and universities. Venkataraman (2004) states that if only seed capital is provided, it flows straight to low-quality ventures. He underlines the qualities of entrepreneurs by mentioning that it must be

accompanied by seven other intangibles, including, access to novel ideas, role models, informal forums, region-specific opportunities, safety nets, access to large markets and executive leadership (Venkataraman, 2004). In addition to those mentioned above, the regional innovation environment, personal bankruptcy legislation, protection of entrepreneur as shareholder and tax system for entrepreneur are pointed out in previous research as necessary policy measures for entrepreneur sector (Munari and Toschi, 2015, Armour and Cumming, 2006; Vanacker *et al.*, 2014; Revest and Sapio, 2012).

Avnimelech *et al.* (2010) uphold an evolutionary approach based on the case studies of Israel, which is well recognized as a haven for the VC market and start-ups. They indicate the significance of long-term commitment and strategic target setting for the development of VC market, high-tech cluster formation as well as policy implementation using a case-to-case approach based on the development phase of high-tech cluster. Other papers also refer to the significance of long-term strategic government commitments for the development of the VC market, stock markets and entrepreneur sector (Lerner and Watson, 2008; Hood, 2000). Jacob *et al.* (2016) find that the change in the policy of government VCs made investors and entrepreneurs pay a higher cost because of the elimination of government tax incentives. Government policies should be well-grounded for a long period of time for a stable VC market.

In the previous section, the Japanese government has intended to position government VC policy as a necessary preliminary step of the “cycle of start-up creation” and to implement along with multiple policies simultaneously, including supports for NTBFs, entrepreneurship training and start-up-friendly environment at the same time. These policies are consistent with the results of previous studies. It is noted that it is not enough for the Japanese government to make VC policies. It should simultaneously continue to make policies not only for the VC market but also for other sectors and the environment surrounding them by its strategic long-term commitment to form the “cycle of start-up creation” in Japanese economy. This simultaneous policy mix leads to the activation of the VC market, as well as NTBFs.

Discussion

Based on the academic literature review on a total of 45 related peer-reviewed papers, this paper analysed the current state and issues of the Japanese government VC policies regarding these research questions: *RQ1*, *RQ2* and *RQ3*.

First, this research has highlighted the complementary relationship between private VCs and government VCs. Although it has not been widely implemented in Japan, extracted six peer-reviewed papers find that syndications with private VCs have positive correlation with portfolio's exit, growth, innovation and staging. Moreover, the positive correlation is also obtained in government fund of funds. Japanese government VCs should be based on the complementary relationship with private VCs[6].

Next, this research has also discussed the development policies of Japanese VC market by government VCs. According to a total of 15 related peer-reviewed papers, it is not sure whether government VCs has contributed directly to the VC market. However, according to the research on NTBF policies including government VC policies, many researchers pointed out the prominence of execution of multiple policies simultaneously. Furthermore, it is also revealed that the effectiveness of strategic government commitments to these sectors for a long period[7]. It is noted that the Japanese government should simultaneously continue to implement policies for the VC market, stock market, entrepreneur sector and the environment surrounding them in addition to the government VC policies by its strategic

long-term commitment. The success of the Japanese VC market and NTBFs depends on the implementation of these policies.

Finally, this paper has laid down the issues on government VCs that are being faced by policymakers and practitioners, which can be the focus of future research.

First, government VCs require complementary relationship with private VCs to get positive investment results, according to previous studies. Nevertheless, there is not sufficient research on proper and practical design of the scheme: What kind of knowledge and skills should government VCs and private VCs provide in the syndication or fund of funds? What criteria do both government and private VCs use in the portfolio selection? What activities do both government and private VCs provide as a support during post-investment period? In this issue, a more detailed research is required. There is no sufficient research on individual fund managers of government VCs such as the correlation between individual fund manager's experiences or rewards and the performance. Such research studies are highly requested on the practitioner side and also are promising research themes. Furthermore, there are few studies on interdisciplinary research on government VCs between economics, management and politics. Here are examples of three interdisciplinary research themes that future researchers can work on the correlation of the performance of government VCs and regional business environment and innovation level (Munari and Toschi, 2015), specific mandate of government VC which is directed to contribute to the VC market and the regional economy in addition to purely private business objectives (Colombo *et al.*, 2016b) and political intervention (Lerner, 2002). Progress on interdisciplinary researches on government VCs should be expected.

Second, regarding the contribution to the development of the VC market, it is unclear whether government VCs crowd-in or -out other VCs. This phenomenon should be examined in detail. If government VCs crowd-in other VCs, how do they contribute to the success of the VC market? If government VCs crowd-out other VCs, do they still contribute to the success of the VC market? If not, how can the VC market still be successful? The VC market's success can also be attributed to other factors such as stock market, entrepreneur sector and institutional or environmental factors. That is why research on the correlation between the development of the VC market and other factors should be conducted.

Because of the success of the US-style VC market, governments all over the world have started putting up their own government VCs for the past ten years. It should be the time for policymakers and practitioners to brush up their policy schemes. For researchers, it is needed not only to increase sensitivity on government VC research but also to expand their focus even to interdisciplinary research areas.

Notes

1. In the Japan Revitalization Strategy 2016, VC investment ratio to nominal GDP in Japan is 0.028, which is based on 3-year average between 2012 and 2014 (Prime Minister of Japan and His Cabinet, 2016).
2. Organization for Small & Medium Enterprises and Regional Innovation provides various support measures to promote growth for 3.8 million Japanese SMEs that account for 99.7 per cent of total firms in the country, operating within the competence of Ministry of Economy, Trade and Industry (METI) of Japan.
3. As Japanese government VCs have been strengthened just in recent years, there are few researches on them with the exception of Ishii (2011), which researched on fund of funds projects by Organization for Small & Medium Enterprises and Regional Innovation. For this reason, the

previous literature review in this paper is composed of researches on government VCs from countries other than Japan.

4. Lerner (1999) finds that government VC investment adds value to the reputation of the portfolio firms.
5. Meuleman and De Maeseneire (2012) find that there is the correlation between government VC investment and long-term debt.
6. As for the syndication with private VCs, there are contradicting opinions among practitioners in Japan. A board member of one of the biggest private VC firms expressed concern about the government university spinoff funds by mentioning that “they will compete with private VCs to get prominent investee firms, as they become more active in the market”. In contrast, a fund manager of a government university spinoff fund said that “private VCs gradually have come back to invest in biotechnology firms, which were thought to be high-risk, as we take the initiative to invest in these investments. This makes it easier for us to have syndication with private VCs. It seems that private VCs consider the syndication with government VCs as risk sharing and the provision of stable and long-time commitment for their portfolios”. Policymakers should adopt measures to promote mutual understanding among practitioners
7. On the Japanese government VC policies, a former policymaker said that “it is effective to do target setting. It is in this sense that the Japanese government has set a target of doubling the ration of VC investment to GDP by 2022. It became easier for policymakers to implement wider range of necessary policies to achieve its KPI on or before 2022”.

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